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METHODS OF COLLECTING, MOUNTING AND PRESERVING HEMIPTERA.

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(Continued from p. 10)

COLLECTING METHODS.

As each group of insects has a preferred habitat collecting methods must be adapted to meet the conditions. Many of the larger Hemiptera may be seen on their food plants, and even some of the smaller ones. It is easy to get these into the killing bottle by putting it under them so they will drop into it when alarmed. But others are secluded in their ways and are best sought for in their chosen habitats by the methods best adapted to get them. In what follows they are considered according to families and groups.

This not being a technical study family and group names are employed quite loosely. The species and groups named are also cited as types, or named because of a particular food plant or haunt, or because they call for special technique.

Pentatomidae.

In this family, the majority are vegetable feeders, at times confined to particular plants, or abundant on them, as *Cosmopepla* on Mulleins, or *Peribalus limbolarius* on *bursapastoris*. The sub-family *Asopinae* however, are predators and, of course, are to be found on the plants frequented by their favored prey. Ordinarily they are beaten from trees into the umbrella, but a certain proportion, particularly *Podisus serieventris* and *maculiventris*, *Minens* and *Perillus* are swept. The plant feeders in general are best taken by sweeping. In the upper part of the grass *Euschisti*, *Trichopepla*, *Cosmopepla*, *Peribalus* and their congeners are found. Lower down we find *Coenus* and the various *Thyreocoridae* and *Cydnidae*, the latter being essentially plant dwellers. Damp situations yield by sweeping *Eurygaster*, and in sedges one gets *Solubea* and the *Lioidermas*, and the latter in salt marshes. Bushes, swept or beaten, give *Nezara* (also to be swept); in grasses in the corners of fields; *Banasa* and *Brochymena*. Most of the latter genus are to be taken from trees—willows, aspens, oaks, etc.—and our principal Eastern scutellerid, *Tetyra bipunctata*, is beaten from scrub pine. *Dendrocoris* occurs on scrub oak from which it may be beaten or swept. The upper layers of trees, little explored as yet, harbor *Elasmostethus* and *Elasmucha*. Certain *Pentatomidae* and *Cynidae* are taken in Europe by searching the roots of plants in sandy spots, dunes and the like. The discussion of this family which precedes, brings out two general principles of application to all the terrestrial families except the strictly predaceous *Reduviidae*, *Nabidae* and *Anthocoridae*.

The first principle is that there are distinct strata of forms among the vegetable feeders. There is a ground stratum where cryptic forms may be found; an upper grass and weed level; a shrubbery and lower tree level; and an upper tree level. Strange to say, the ground level and the upper tree level have been but little explored with us. And it might seem as though these two strata would offer the best opportunities for finding novelties. The other principle, of course, is that which divides all bugs into vegetable feeders and predators. The latter follow their prey, and at times are found in the most unlikely places.

The general conditions of insect abundance of course govern in the Hemiptera. Country roadsides, lanes and hedges are always good; lush damp fields, particularly young trees, are very fruitful. But trees growing in deep woods, if they harbor any bugs, yield perhaps not more than one special species, but that in abundance. This, of course, is true of any homogeneous vegetation—grasses, shrubs, even mosses. At such times the careful, farseeing collector lays in a good supply—the time, the place and the favorable conditions may not come about again for lengthy periods. The carnivorous species are likewise governed by the conditions that regulate the abundance of their prey, mainly caterpillars.

Coreidae

The general remarks already made apply to this family as well. In the subfamily *Coreinae* the species are mainly swept along the edges of fields. *Archimerus*, *Euthoantha*, *Acanthocephala*, and the latter is also beaten from young growth at the edges of woods. *Merocoris* occurs in dry fields and sometimes on carrion.

Among the *Alydinae*, *Alydus* is to be swept from clovers, although the nymphs at times are found running on bare sandy spots with the large red ants which they much resemble.

Protenor is found abundantly by sweeping in swampy meadows; *Tollus* and *Stachyocnemus* are best taken by searching sandy spots, where they may be found running about among the scant grasses. *Anasa tristis*, of course, on squash vines, but *A. repetita* only on wild cucumber (*Sicyos*).

In the *Corizinae*, *Harmostes* occurs in general sweeping, and so does *Rhopalus* (*Corizus*), but the latter is sometimes to be found in knotweed or even in dry sandy bare spots. *Corizus hirtus* is found by sweeping grasses near the seashore in sandy places. Of course, many of these forms, as well as those of other families, are sure to be found in the net or umbrella, but the places mentioned are the best for getting them, if they are there.

Aradidae.

Of course, everyone knows how to get these under bark of dead trees. They are found particularly in fall, spring and winter under loose bark of dead trees not yet decayed and soft. *Nannium pusio*, however, has been sifted from rotted stumps. *Aneurus fiskei* may be beaten at all seasons of the year from limbs of shagbark hickory. *Neuroctenus* and some *Aradus* seem to prefer bark of conifers, living or dead; and *A. cinnamomeus* is always to be taken by beating vigorously scrub pine branches. Sometimes these forms may be taken in flight in the spring—*A. 4-lineatus* for example; or under bark of fence poles

or cord wood with other dendrogenous (?) forms. *A. robustus* has been taken quite often under flat stones on a hillside, occasionally by sifting. *A. similis* is found either under bark of rotting white birches or on or under or in living *Polyporus betulinus*. Little is known exactly about the habitats of this group as no precise data seems to have been secured as to when and where and under what conditions to expect each species. They may, however, be successfully sought for at all seasons of the year.

Lygaeidae.

The forms of this group are in general small, sober-colored, inconspicuous and retiring. They are not frequent in collections on this side of the water, but in Europe they are much better known and their habitats and ways better understood.

The *Lygaeinae* contain the larger and more showily colored species in blacks and scarlets. These are ordinarily to be swept here and there. But with us, both *Oncopeltus* and *Lygaeus kalmii* are common on *Asclepias*.

The smaller species of the other subfamilies have in general preferred habitats. *Cymus* is ordinarily found on sedges or rushes in damp situations, although the species seem to have preferred food plants. *C. discors* is abundant in flower and seed heads of *Scirpus polyphyllus*; *C. robustus* Barber, on species of *Juncus*; *C. angustatus* is a general feeder; *C. virescens* Fabr. (*exiguum* Horv.), also on sedges. *Oedancala* is found in similar situations and is frequently found in the sweeping net with *Cymus*. *Crophius disconotus* occurs near swamps on the dry upland margins and is swept most frequently from golden rod.

The various species of *Nysius* and *Geocoris* are ground dwellers. They are to be picked up from the sand about the roots of clumps of grasses and weeds. At times *Nysius* may be swept from the growth in such places. *Isthmocoris piceus* lives in grassy fields, where *Potentilla* abounds and is best taken by sweeping close to the ground. *Ligyrocoris* occurs in general sweeping, *L. depictus* is found on bunch grass in marshy spots, as well as the species of *Scolopostethus*. *Pseudocnemodus* is taken in grassy fields by sweeping with the net close to the earth. *Cryphula*, *Eremocoris*, *Drymus* and *Antilocoris* are sometimes taken by sweeping grasses, but in winter mostly by collecting under stones or sifting. *Ischnorhynchus* occurs on black birch whence it may be beaten; or on *Spiraea* in numbers in the fall. *Zeridoneus* and *Perigenes* are also swept from short grasses here and there. As many Lygaeidae are earth surface dwellers they may be taken at all seasons of the year by sifting leaves. Some also, as *Ozophora*, are also to be taken at trap-lights.

Tingidae.

These are all leaf-feeders and are to be taken by beating trees and shrubbery, as well as by sweeping. *Corythucha* occurs on fixed food-plants although some may have more than one. *C. marmorata* is abundant on goldenrod, generally in the lower leaves; *C. pergandei* on alder; *C. crataegi* on *Crataegus*; *C. associata* and *pruni* on wild cherry (*Prunus*); *C. juglandis* on butternut and black walnut; *C. arcuata* on oak; *C. ciliata* in enormous numbers on sycamore. *Piesma cinerea*, now put in a family all its own, has been found

under sycamore bark in winter. Ordinarily it is taken by sweeping. The various *Physatocheilae* are generally beaten from trees; *P. variegata* occurs on black willow; *P. plexa* also.

Leptonypha mutica on ash and *Cephalanthus*; *Melanorhopala clavata* on the edges of damp meadows near the roots of grasses, etc. *Stephanitis pyrioides* is found on Azalea; and *St. rhododendroni* on *Kalmia* and Rhododendrons; wild indigo (*Baptisia tinctoria*) feeds *Gelchossa heidemanni*; *Acalypta lillianis* is found in moss. *Gargaphia tiliae* occurs on *Tilia*; and *G. angulata* in vast numbers on *Ceanothus*. These notes are merely offered as suggestions, since not alone are other food-plants recorded for many of these and other species, but there is every likelihood that new food-plants may be discovered from time to time.

Anthocoridae and Cimicidae.

The latter in its domestic representative needs no directions, although at times it abounds in hen-houses. *Oeciacus vicarius* is found in nests of chimney swallows in great abundance in the fall; the bat-bug in bat's roosts. Another species found in henhouses is *Haematosiphon inodora*, not yet reported from the northern part of the country.

The *Anthocoridae* being also predaceous are found with their prey. *Triphleps* is usually taken by sweeping flower heads, where it feeds on *Thrips* and other small forms; *Anthocoris* is beaten from trees; *Xylocoris* is found under bark of dead trees. The others are swept and beaten here and there in miscellaneous collecting.

Nabidae, Emesidae, Phymatidae and Reduviidae.

All these are predaceous. All *Nabidae* are commonly taken by sweeping, particularly *N. ferus* and *N. rufusculus*; *N. annulatus* is taken by beating; *N. propinquus* occurs in sedges. *Pagasa* is found running on the ground among and under dead leaves and must be searched for. *Carthasis* is beaten occasionally in miscellaneous collecting.

Emesa is found in barns, although I have swept it from shrubbery in the corners of fields. *Barce* is occasionally swept, but I find it mostly under stones in fall and spring.

Phymata occurs in flower heads in wait for prey, particularly in Queen Anne's lace, and is taken in general sweeping.

The *Reduviidae* are not so well known. *Melanolestes* is found under stones or planks in fields; *Reduvius* frequents houses; *Sinea diadema* may be swept abundantly from red clover; but *Acholla* occurs in trees and falls in the umbrella, and so does *Sinea spinipes*. *Oncerotrachelus* is sifted. I have found it in sphagnum in fall and spring. *Zelus* is found on trees also, but is occasionally swept, and in winter nymphs may be sifted.

Ceratocombidae and Isometopidae.

These two small and obscure families are little known in America. The few specimens of *Ceratocombidae* heretofore taken have been sifted from leaves in damp woods.

The *Isometopidae* much resemble small mirids and in general are taken by beating dead and fungus-grown branches in woods.

Miridae

The *Miridae* in general are plant feeders; some few groups are predaceous on *Aphids* and other small soft-bodied insects. When abundant they are quite visible and may be caught directly into the killing bottle. A good way to catch tree-inhabiting forms such as *Phytocoridae* and *Deraeocoridae* is to look up into the trees when they may be seen on the under side of the leaves and bottled at once.

The two best ways to get these species are by beating and sweeping. In favorable situation they may be secured in great numbers. *Monalocoris* occurs on ferns; *Ceratocapsus* on trees, particularly dogwoods and oaks; *Pilophorus* and its allies on conifers, but also some on orchard trees; *Alepidia* on pines; *Pithanus* in grasses; *Mimoceps* in bunch grasses. The vast number of species of this group (they form one-third of any Heteropterous fauna) and the fact that they are practically of universal distribution makes more detailed treatment undesirable.

In common with *Lygaeids* they are frequently found at trap lights and also sifted in winter.

The *Hemiptera of Connecticut* is an invaluable source of specific habitats.

The Aquatic and Semi-Aquatic Groups.

These families—the *Naloxidae*, *Mesovelidae*, *Gerridae*, *Veliidae*, *Hydrometridae*, *Acanthiidae* (*Salidae*), *Ochteridae*, *Gelastocoridae*, *Nancoridae*, *Belostomatidae*, *Notonectidae*, *Corixidae* and *Nepidae* were covered quite extensively in my "Directions" published in 1905.¹

The American habitats of these have been set forth in various papers since that time by Dr. H. B. Hungerford and myself. What follows, therefore, is a brief resume with such additions as experience has brought about.

Hebrus is found walking about in damp spots around ponds, streams, marshes or mud-holes. It can readily be seen as it moves and picked up with the fingers. In winter it is occasionally sifted. And it may also be swept once in a while from among grasses in marshy spots. The sluggish *Merragata*, however, seems to frequent floating vegetation, such as duckweed and waternet. It may be taken from masses of these brought up by the waternet. *Mesovelia* is taken at the same time, although this bug is very lively and takes to open water when closely pursued; it is frequently to be found in colonies on water-lily leaves or other vegetation at the surface. *Hydrometra* is always found near the shore in still coves or pools; the hard waternet is good to capture it, although it may be picked up with the fingers.

The *Gerridae* divide into two habitats—still and flowing waters. On the still waters one gets with the net the smaller forms (subgenus) *Linnotrechus* always near the shore, together with *G. rufoscutellatus*. In larger bodies of water, the *Halobatinae* are the deep water forms—such species as *Metrobatis*, *Trepobates* and *Rheumatobates*—and also *Gerris* (*Limnogonus*) *hesione*. The Halobatines are wary and swift and must be caught by quick motions of the net. At times they congregate in great numbers in coves and about boat docks or steep rocky shores.

1.—Can. Ent. XXXVII, 137-142.

The *Veliidae* may also be divided into running and still water forms. *Rhagovelia* is always to be found in streams, generally in the swift water; or in the eddies about projecting rocks. *Microvelia* haunts the surface growth of still waters, or, as *M. americana*, walks about the shores of streams and ponds; *M. fontinalis*, on the other hand, is found in small pools, although it has been sifted in winter from leaves about a marsh. Some foreign species (the winged form) have been collected at light.

The *Acanthidae* (*Saldidae*) are not so well known in America. In general they are to be found on the shores of streams or bodies of water or on mudflats, walking about among the vegetation. They may be swept, but it is better to catch them with the butterfly net passed close to the ground. *A. saltatoria* has been found on rocks in streams, and has also been sifted from dead leaves about the edge of a swamp in winter. The most abundant, widespread and variable species is *A. interstitialis*. The *Ochteridae* and *Gelastocoridae* are found in the same situations as the *Acanthidae*, but not necessarily together. These forms are cryptic to a great degree. *Ochterus* frequents black mud, where it blends in when it crouches into some little hole. *Gelastocoris*, on the other hand, is found on sandy or pebbly places by preference. Both of these genera must be hand picked.

The *Naucoridae* and *Belostomatidae* frequent vegetation near the shores of ponds and are taken by dragging with the water net. It must be borne in mind that these are *not* deep water forms and should be sought for in vegetation in relatively shallow waters, much weed filled.

The *Notonectidae* are taken in the same manner as the *Belostomatidae* and are frequently found in the same netful, as indeed may be any of the sub-aquatic forms, although each has a preferred habitat. *Notonecta insulata* prefers clear deep waters; *N. irrorata* is found in darker waters, as a general rule; the other species are more general in their habitat. *Buenoa*, on the other hand, seems to prefer clear open spaces in fairly deep water, such as rock holes or abandoned quarries.

Corixidae are bottom dwellers, and may be seen at the bottom of ponds and slow streams. The net must be moved very quickly to catch these. As it moves along they rise like a flock of tiny birds and flit away in front of it.

The *Nepidae*, those strange aberrant bugs, with us have only two genera,—*Nepa* and *Ranatra*—although *Curicta* is to be found in the southwest. *Nepa* is found in shallow waters, among weeds and grasses or under stones. *Ranatra* on the other hand, frequents deeper waters, among reeds and grasses, or concealed in trash. The ways to take them are obvious. The trash drawn in the water net must be examined slowly, and the little piece of debris, the waterlogged twig, develops legs in motion.

This, in a general way, covers habitats as well as the best methods to collect waterbugs. To be sure it is not always that one will get a homogeneous netful, so to speak, for two or three or even more, forms may be in the same spot and appear in the same netful. Nor does it follow that one will be certain of getting the sought-for species even in the most favorable-looking spot. But these are tested methods, and will in the long run give results.

(To be Continued)

CANADIAN BEES OF THE GENUS OSMIA

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The Osmias in the Canadian National Collection are chiefly from the southern part of Canada, and have proved to be very like those of the northern United States. In southeastern Canada are found the species of the eastern United States, while in southwestern Canada are found species which also occur in the Rocky Mountains of Colorado and Wyoming, and in Washington and Oregon. As a result of this study of the undetermined Osmiid material in this collection, the number of species in the Canadian collection has been increased from twenty-two to sixty. It is interesting to note that of this number only three species—*frigida* Smith, *subarctica* Cockerell, and *sladoni* Sandhouse—are not also recorded from the United States; *sladoni* is closely related to *O. vanduzeei* Sandhouse, of the Pacific Coast region. Throughout the entire North American continent the *Osmia*-fauna of the western part is much richer in number of species and in diversity of form than that of the eastern portion. It is possible that the Osmias of northern Canada and Alaska may prove to be quite different from those of the southern part, but little material has yet been collected in that region.

Keys are given to the species recorded from Canada, and the writer trusts they may prove useful in separating the species occurring there.

The writer has examined the male genitalia of practically all the North American species and has found them to be distinctive and constant for each species. This has proved to be a useful check in determining species and also of the amount of variation within species; and apparently this will be of value in the formation of groups within the genus. In some cases the correlation of the characters of the genitalia with external characters—as modified legs, peculiar flagella, shape of the third ventral segment of the abdomen, etc.—is very clear; while in other cases the relations of the external characters are not so distinctive and further study will be necessary to define the groups. In a later publication the writer hopes to figure the genitalia and discuss the relationship within the genus.

To Dr. J. H. McDunnough the writer is greatly indebted for the opportunity of studying this material. And to Professor Cockerell, of the University of Colorado, for the use of his named material and literature, as well as for his helpful suggestions and criticisms.

***Osmia sladoni* nov. sp.**

This species was placed in the genus *Monilosmia* by Sladen under a manuscript name not available for use; the species however does not belong in *Monilosmia* and the writer has changed the specific name to *sladoni*.

Male—About 11 mm. long; robust; brassy green; pubescence of head, thorax and first dorsal segment of abdomen all pale except for a few black hairs on the cheeks; hair of abdominal segments 2-7 largely black. Head normal; orbits nearly parallel; flagellum dark brown, ferruginous beneath, crenulate but less strongly so than the other species of this group (*Acanthosmioides*); scape of antennae black; face above closely punctured; sides of face and supraclypeal area concealed under a dense white pile, which is very dense and long on the

clypeus so that the hairs stand erect; mandibles black, bidentate, the apical tooth long; hair of occiput tinged with ochreous. Thorax clothed with abundant pubescence, on the dorsum and pleura it is somewhat ochreous; mesothorax very densely and finely punctured; scutellum with punctures a little coarser; disk of propodeum dull and dark blue, green above, lower half color of thorax; tegulae piceous, anterior portion with a tuft of pale hairs; Wings dusky hyaline; basal nervure behind nervulus; second cubital cell contracted more than one-half above, hardly longer than first on marginal, receiving the first recurrent nervure one-fourth from the base and the second recurrent nervure at least one-fifth from the apex. Legs black, with obscure metallic reflections; hairs of anterior legs all white, of middle and posterior legs with some black hairs intermixed; on the inner sides of the tarsi the hair is fusco-testaceous; apical tarsi ferruginous; hind tibial spurs practically straight. Abdomen shining, the punctures piliferous; first dorsal segment with long white pubescence, on the second segment it is shorter and tinged with fuscous; hair of segments 3-7 black, with submarginal bands of pale hair; punctureless apical margins of segments broad; sixth dorsal segment entire; seventh dorsal segment with a broad deep notch; first ventral segment with pale hair, the remaining segments of the venter with black hairs, except for the long fulvous fringe on the deep, but narrow emargination of the third segment; second ventral segment with a median polished streak, and a dark testaceous finger-like process.

Holotype—♂, Invermere, British Columbia, May 19, 1915, (F. W. L. Sladen); No. 904 in Canadian National Collection.

Paratypes—2 ♂, same data; 1 ♂, Banff, Alta., May 21, 1915, (F. W. L. Sladen).

***Osmia theta* nov. sp.**

This species was named by Sladen in manuscript, but a careful search has revealed no description; so the writer gives the following description.

Male—About 11 mm. long; dark blue-green; hair of head and thorax pale, except for some black hairs on the vertex; hair of abdomen largely black. Head ordinary; clothed with quite dense and long pubescence; face with close shallow punctures; antennae black, almost reaching the posterior of the scutellum; anterior margin of clypeus black, truncate, fringed with yellowish hairs; mandibles black, the apical tooth long. Mesothorax closely and finely punctured; scutellum shining between more sparse punctures, with a median polished streak; hair of thorax rather long; disk of propodeum dark blue, dull and somewhat roughened; tegulae black, the anterior margin greenish and punctate. Wings faintly dusky; marginal cell with a fuliginous streak; basal nervure before nervulus; second cubital cell about twice as long as first on marginal, receiving the first recurrent nervure about one-fifth from the base and the second recurrent nervure about one-sixth from the apex. Legs black; pubescence largely pale, with long black hairs intermixed; hair on inner side of tarsi ochreous; apical tarsi reddened; hind basitarsi broadly toothed; hind tibial spurs curved at the apex. Abdomen shining dark blue, faintly greenish; the punctures piliferous; punctureless apical margins of segments broad; hair of first dorsal segment white and also on the base of the second segment; hair of remaining segments largely black,

except for some white hairs on middle of fifth and sixth segments; sixth dorsal segment weakly notched; seventh dorsal segment sharply notched; third ventral segment with a broad emargination, fringed with fulvous hairs.

Holotype—♂, Banff, Alberta, May 21, 1915, (F. W. L. Sladen), in Cockerell Collection.

Paratypes—2 ♂, Blackwater Lake, Lillooet, B. C. May 21, 22, (E. M. Anderson); 1 ♂ Cranbrook, B. C., May 16, (C. B. Garrett); 1 ♂, Invermere, B. C., May 27; 2 ♂, Banff, Alta.; No. 1211 in Canadian National collection.

KEY TO MALES.

Species brilliant green or blue-green, sometimes purplish or with purple tints	1.
Species dark blue or green or black (<i>globosa</i>)	4.
1. Smaller species 5-6 mm. long, with pubescence entirely pale; flagellum testaceous beneath	<i>kincaidii</i> Cockerell.
Larger species; at least the abdomen with some black hairs	2.
2. Species entirely purple, including legs and tegulae; hair of pleura and cheeks black	<i>cobaltina</i> Cresson.
Species green or blue-green; hair of pleura pale, of cheeks entirely or largely pale	3.
3. Hair of mesothorax entirely pale; head and thorax golden green; scutellum coarsely punctured	<i>holochlora</i> Cockerell.
Some black hairs intermixed with the white on mesothorax; head and thorax pure green; scutellum finely punctured	<i>bella</i> Cresson.
4. First ventral segment of abdomen ending medially in a spine; second ventral segment with a small spine; apical joint of antenna flattened <i>abnormis</i> Cresson.	
First ventral segment of abdomen without a spine; apical joint of antennae not flattened	5.
5. Second ventral segment of abdomen ending medially in a rounded lamelliform process; flagellum strongly crenulate beneath	6.
Second ventral segment of abdomen without such a process,—somewhat thickened medially in <i>bucephala</i> , flagellum not crenulate	9.
6. Pubescence entirely pale	7.
Abdomen dorsally with some black hairs	8.
7. Species blue-green; pubescence white; apex of hind tibiae normal; third ventral segment of abdomen with a shallow emargination, fringed with short hairs	<i>physariae</i> Cockerell.
Species bronze green; pubescence ochreous; hind tibiae truncate at the apex; third ventral segment of abdomen with a deep emargination, fringed with long hairs	<i>odontogaster</i> Cockerell.
8. Hair of cheeks white; venter of abdomen with hair largely pale; basal nervure before nervulus	<i>nifoata</i> Cockerell.
Some black hairs on cheeks; venter of abdomen with hair all black except a yellow fringe on emargination of third segment; basal nervure behind nervulus	<i>sladeni</i> Sandhouse.
9. Middle tarsi thickened	10.
Middle tarsi not modified	13.

10. Larger species; basitarsi of middle legs greatly thickened; seventh dorsal segment of abdomen strongly notched 11.
- Smaller species; basitarsi of middle legs not modified; seventh dorsal segment of abdomen with a broad shallow emargination 12.
11. Species about 15 mm. long; sixth dorsal segment of abdomen broadly truncate apically; hair of sixth segment largely white; hind basitarsi clavate, not toothed; hind tibial spur almost as long as basitarsus, falcate *bucephala* Cresson.
- Species about 10-11 mm. long; sixth dorsal segment of abdomen rounded apically, with hair largely black; hind basitarsi with a broad tooth about $\frac{1}{3}$ from the apex; tibial spurs short and slender *kenoyeri* Cockerell.
12. Hair of head and thorax entirely pale *universitatis* Cockerell.
- Hair of cheeks black, of sides of propodeum black *integrella* Cockerell.
13. Black species 14.
- Species dark blue or green 15.
14. Smaller species, about 7 mm. long; sixth dorsal segment of abdomen rounded apically, with a shallow median notch; basal nervure behind nervulus; pubescence largely pale; hind basitarsi toothed; tibial spurs short and straight. *globosa* Cresson.
- Larger species, about 10 mm. long; sixth dorsal segment of abdomen broadly truncate at the apex, entire; basal nervure before nervulus; hair of dorsal abdomen largely black; hind basitarsi clavate, not toothed; tibial spurs longer and curved at the apex *frigida* Smith.
15. Pubescence entirely pale 16.
- Pubescence with some black hairs 22.
16. Flagellum moniliform; hind basitarsi clavate; hind tibial spurs long and curved (Monilosmia) *canadensis* Cresson.
- Flagellum ordinary; hind basitarsi not as above 17.
17. Sixth dorsal segment of abdomen produced in the middle, not notched 18.
- Sixth dorsal segment of abdomen not produced in the middle; strongly notched, except *albiventris* 19.
18. Third ventral segment of abdomen entire, or hardly emarginate; hind basitarsi toothed; sixth dorsal segment of abdomen hardly sinuate at the sides; seventh dorsal segment narrowly notched *nemoris* Sandhouse.
- Third ventral segment of abdomen deeply emarginate; hind basitarsi not toothed; sixth dorsal segment of abdomen deeply sinuate at the sides, forming two lateral teeth; seventh segment deeply notched; so that the view of the two combined segments appears quadridentate *conuncta* Cresson.
19. Large blue species, 12-13 mm. long; strongly punctured; submarginal region of dorsal segments of abdomen very closely and finely punctured; punctureless apical margins of segments very narrow *mandibularis* Cresson.
- Smaller greenish species, 8-9 mm. long; more weakly punctured; punctureless apical margins of abdominal segments broader 20.
20. Sixth dorsal segment of abdomen broad, entire; second cubital cell receiving the second recurrent nervure very near the apex; head broad; hind basitarsi broadly toothed near apex *albiventris* Cresson.

Sixth dorsal segment of abdomen notched in the middle; second cubital cell receiving the second recurrent nervure some distance from the apex; head ordinary 21.

21. Blue-green species; hind basitarsi toothed in the middle; pubescence white *eutrichosa* Cockerell.
Brassy green species; hind basitarsi not toothed; pubescence fulvous *coerulescens* Linn.

22. Large species 12-13 mm. long; sixth dorsal segment of abdomen broad; hair of dorsal segments one and two entirely pale; hair of thorax entirely pale *integra* Cresson.
Smaller species; sixth dorsal segment of abdomen rounded apically; pubescence not as above 23.

23. Hair of pleura white 24.
Hair of pleura black, or with some black hairs present 29.

24. Hind basitarsi toothed 25.
Hind basitarsi not toothed 26.

25. Flagellum ferruginous beneath; legs metallic; head and thorax brassy green; sixth dorsal segment of abdomen strongly notched *pseudamala* Cockerell.
Flagellum dark brown beneath; legs black; head and thorax blue; sixth dorsal segment of abdomen weakly notched *seneciophila* Cockerell.

26. Some black hairs intermixed with the white on mesothorax, scutellum and face; sixth dorsal segment of abdomen entire *olivacea* Cockerell.
Hair of mesothorax, scutellum and face entirely pale 27.

27. Marginal cell with a fuliginous streak; sixth dorsal segment of abdomen weakly notched *theta* Sandhouse.
Marginal cell not so; sixth dorsal segment of abdomen strongly notched 28.

28. Flagellum clear ferruginous beneath; second cubital cell receiving the first recurrent nervure hardly one-fourth from the base; meso thorax and scutellum golden green, shining between punctures *mertensiae* Cockerell.
Flagellum dark ferruginous beneath; second cubital cell receiving the first recurrent nervure about one-fourth from the base; meso thorax and scutellum blue, very closely punctured *wheeleri* Cockerell.

29. Sixth dorsal segment of abdomen entire 30.
Sixth dorsal segment of abdomen notched 31.

30. Dark green, or blue-green species; seventh dorsal segment of abdomen entire; third ventral segment with a deep broad notch *lignaria* Say.
Dark blue species; abdomen purplish; seventh dorsal segment of abdomen notched; third ventral segment hardly notched *montana* Cresson.

31. Species small; some black hairs on mesothorax; third ventral segment of abdomen emarginate; hair of cheeks largely pale *gilligolia* Cockerell.
Species large; hair of mesothorax pale; third ventral segment of abdomen entire; hair of cheeks largely black *viridior* Cockerell.

KEY TO FEMALES

Brilliant species, usually blue-green, sometimes with purplish tints 1.
Species with at least the thorax dark blue or green, or black (*globosa*) 4.
1. Species brilliant purple, including legs and tegulae—pubescence largely black;

hair of mesothorax black and white mixed *cobaltina* Cresson.
 Species green or blue-green 2.

2. Hair of pleura black; face with long black bristles; hair of cheeks black; hair of mesothorax white with a few black hairs intermixed *bruneri* Cockerell.
 Hair of pleura pale; face without such bristles; hair of cheeks pale 3.

3. Species small—not over 8 mm. long; hair of face, mesothorax and scutellum white with some black intermixed; abdomen dorsally with black hairs; mesothorax shining between punctures; abdomen with indistinct punctures; punctureless apical margins of abdominal segments broad; tegulae entirely metallic *kincaidii* Cockerell.
 Species larger—10 mm. long; pubescence excluding scopa pale; mesothorax closely punctured; abdomen very closely punctured, punctureless apical margins of segments very narrow; tegulae brown with a metallic spot in front; second cubital cell receiving the second recurrent nervure very near the apex *bella* Cresson.

4. Species black; about 10 mm. long; hair of thorax pale fulvous, of face cream color, of clypeus fuscous, of lower half of cheeks fuscous; marginal cell with a fuliginous streak *globosa* Cresson.
 Species dark blue or green 5.

5. Clypeus modified 6.

Clypeus ordinary 11.

6. Clypeus almost entirely polished and impunctate; mandibles very long; cheeks broad and armed—head and thorax black and dull *armaticeps* Cresson.
 Not so 7.

7. Clypeus broadly emarginate; hair of pleura black, of abdomen largely black, of head and thoracic dorsum largely black—species very dark blue or blue-green *lignaria* Say.
 Clypeus not so broadly emarginate; with two teeth in the middle; pubescence entirely or exclusive of scopa, pale; species lighter in color 8.

8. Scopa white; smaller, grayish blue-green species; abdomen with indistinct punctures 9.

Scopa black; larger, steel blue species; abdomen more strongly punctured; marginal cell largely fuliginous 10.

9. Mandibles with basal tubercles; hair on inner side of hind tarsi yellowish *georgica* Cresson.
 Mandibles without basal tubercles; hair on inner side of hind tarsi fuscous *coloradensis* Cresson.

10. Mandibles with basal tubercles *mandibularis* Cresson.
 Mandibles without basal tubercles *facta* Cresson.

11. Scopa pale 12.

Scopa black 15.

12. Pubescence, including scopa, yellowish; scopa black at the apex; clypeus with a small polished triangular area at the median base; hair on inner side of hind tarsi fuscous *distincta* Cresson.
 Pubescence, including scopa, white; clypeus without such a polished area 13.

13. Abdomen indistinctly punctured; species smaller; punctureless apical margins of abdominal segments broad; scutellum with a median polished streak; sec-

ond cubital cell receiving the second recurrent nervure near the apex..... *albiventris* Cresson.

Abdomen very strongly or finely punctured; species larger; punctureless apical margins of abdominal segments very narrow; scutellum without a median polished streak 14.

14. Head large, subcircular; abdomen, mesothorax and scutellum finely and densely punctured; second cubital cell receiving the second recurrent nervure very near the apex *canadensis* Cresson.

Head ordinary; abdomen, mesothorax and scutellum coarsely punctured; second cubital cell receiving the second recurrent nervure about one-fourth from the apex *conjuncta* Cresson.

15. Pubescence, exclusive of scopa, entirely pale 16.

Some black hairs, other than those of scopa, present 18.

16. Species purplish; head large; abdominal segments with apical hairbands; abdominal segments very closely punctured, punctureless apical margins of segments very narrow *coerulescens* Linn.

Species blue, or grayish blue-green; without apical hairbands on abdominal segments 17.

17. Larger, robust, grayish blue-green species; head very large; species very large; species very closely and finely punctured; second cubital cell receiving the second recurrent nervure very near the apex *seclusa* Sandhouse.

Smaller, blue species; head ordinary; mesothorax shining between quite coarse punctures; second cubital cell receiving second recurrent nervure about one-fifth from the apex; abdomen less distinctly and finely punctured *atriventris* Cresson.

18. Hair of pleura light 19.

Hair of pleura black 24.

19. Mesothorax with pubescence entirely pale, (or very few black hairs in *clarescens*) 20.

Mesothorax with some black hairs intermixed with the white 22.

20. Species French blue; not at all greenish blue; tegulae and legs metallic; mesothorax shining between punctures; few inconspicuous black hairs on mesothorax *clarescens* Cockerell.

Species more greenish; tegulae and legs not metallic, or tegulae obscurely metallic in front; mesothorax very closely punctured 21.

21. Species larger, 10-11 mm. long; scutellum with a median polished streak; basal nervure going some distance before nervulus *densa* Cresson.

Species smaller, 8-9 mm. long; scutellum without a median polished streak; basal nervure meeting nervulus or just before it *melanotricha* Lovell and Cockerell.

22. Species slender; face clothed with long black bristles; legs strongly blue... *pentstemonis* Cockerell.

Species more robust; face without bristles, some white hairs on face; legs obscurely blue, or entirely black 23.

23. Species large, 12-13 mm. long; tegulae black; cheeks below with long black hairs; marginal cell quite dusky *subpurpurea* Cockerell.

Species small, 8-9 mm. long; tegulae metallic in front; hair of cheeks not so; marginal cell not dusky *phaceliae* Cockerell.

24. Mesothorax with hair entirely light 25.
Mesothorax with some black hairs intermixed with the white 31.

25. Face with some white hairs; hair of mesothorax fox red; larger species 26.
Face with black hair; hair of mesothorax yellowish or white; small species 27.

26. Disk of propodeum dull and somewhat roughened; second cubital cell receiving the second recurrent nervure about one-fifth from the apex
..... *longula* Cresson.
Disk of propodeum smooth and shining; second cubital cell receiving the second recurrent nervure very near the apex *novomexicana* Cockerell.

27. Species olive green; hair of mesothorax and scutellum fulvous; robust species; punctureless apical margins of abdominal segments broad *kenoyeri* Cockerell.
Species blue, or slightly greenish blue 28.

28. Species robust; punctureless apical margins of abdominal segments broad and purplish; mesothorax dull, very finely and closely punctured
..... *hendersoni* Cockerell.
Species ordinary; punctureless apical margins of abdominal segments narrow and not purplish 29.

29. Species large—13-14 mm. long; punctureless apical margins of abdominal segments quite narrow *nigrifrons* Creeson.
Species smaller; punctureless apical margins of abdominal segments moderately broad 30.

30. Mesothorax lighter blue, very closely punctured; disk of propodeum blue and smooth; basal nervure behind nervulus *subtrevoris* Cockerell.
Mesothorax dark blue, shining between punctures; disk of propodeum very dark blue, dull and slightly roughened; basal nervure before nervulus
..... *grindeliae* Cockerell.

31. Species very small, 6-7 mm. long; legs metallic; face clothed with black bristles 32.
Species larger; legs not at all metallic 33.

32. Species dark blue; pleura with a patch of white hair below
..... *hypoleuca* Cockerell.
Differing from *hypoleuca* only by having the hair of pleura entirely black *cyanosoma* Cockerell.

Species more greenish blue; hair of face less bristle-like than above; mesothorax more roughly punctured *tristella* Cockerell.

33. Cheeks with long curled black hairs on lower half; 12-13 mm. long; dark blue; mesothorax very densely and roughly punctured *proposita* Sandhouse.
Cheeks without such curled hairs 34.

34. Head subquadrate, black; cheeks broad 35.
Head ordinary 36.

35. Clypeus closely punctured; hair of mesothorax white, with an interalar band of black hairs; marginal cell quite clear *wardiana* Cockerell.
Clypeus shining between well-separated punctures; hair of mesothorax black and white intermixed, not banded; apex of marginal cell smoky
.....

..... *pascoensis* Cockerell.

36. Face clothed with long black bristles; tegument of front black and rough....
..... *wilmattae* Cockerell.

Face clothed with short hairs, no bristles present; tegument of front not black and rough 37.

37. Mesothorax shining between punctures; anterior margin of clypeus depressed in the middle; supraclypeal area with smooth areas; upper half of marginal cell fuliginous *leonis* Cockerell.

Mesothorax closely and roughly punctured; anterior margin of clypeus truncate; supraclypeal area uniformly punctured; marginal cell not fuliginous 38.

38 Hair of cheeks at least half pale; larger species; hair of face largely white; mesothorax greenish *senior* Cockerell.

Hair of cheeks black; smaller species; hair of face largely black; mesothorax very dark blue *atrocyanæa* Cockerell.

(To be Continued)

NEW EPHEMERELLA SPECIES (EPHEMEROPTERA).*

BY J. McDUNNOUGH,

Ottawa, Ont.

In anticipation of a more extended paper on this difficult genus I offer the following descriptions of four new Canadian species. These are all small, blackish-looking species, varying somewhat in size but in general quite similar in appearance; they show, however, good distinguishing characters in the male genitalia.

Ephemerella simplex n. sp.

Male. Eyes deep brown (dried); head, thorax and dorsum of abdomen deep black-brown; the lateral edge of the mesonotum and the dorsal transverse suture pale brown; the central portion of the mesosternum black-brown, the lateral projections, between the first and second pairs of legs, largely light brown; dorsum of abdomen almost unicolorous black-brown, slightly paler laterally, especially on segments 8 and 9 which show considerable paler brown shading; ventrally the abdomen is dull ochre-brown with the 9th segment and the forceps shaded with black-brown; setae dull smoky. Forelegs blackish, other legs dull ochre-brown, the same shade as abdomen ventrally; relative length of foreleg joints, femur 30, tibia 48, tarsi 2, 25, 25, 15, 6; hind leg with femur and tibia subequal and tarsi about $\frac{2}{3}$ of tibia. The male penes are quite characteristic, viewed laterally they curve upward, but are not sharply angled at base, ending in two broad lobes, proximad to which is a slight ventral heart-shaped depression; the apices of the lobes are furnished with a number of minute papillæ, showing on a slide with higher magnification as small hyaline dots. Wings hyaline, the longitudinal veins tinged with brown, the crossveins only well-defined in the apical section of primaries. Length of body 6 mm.; of forewing 6 mm.

Female. Very similar to male but slightly paler in color; head entirely brown with slight black spotting in the central area between the eyes; subanal plate moderate in length, shovel-shaped, rounded apically.

*—Contribution from the Div. of Syst. Ent., Entomological Branch, Department of Agriculture, Ottawa.

Holotype—♂, Laprairie, Que., July 8, (G. S. Walley); No. 1276 in the Canadian National Collection.

Allotype—♀, same data.

Paratype—1 ♂, same data.

***Ephemerella attenuata* n. sp.**

Male. Eyes deep brown; head and thorax deep black-brown; abdomen dorsally dark brown shading into paler brown on the posterior three segments, ventrally paler with eighth segment quite pale creamy brown; forceps whitish, shaded with light brown at base, setae white. Legs pale yellowish white, the forelegs darker, with the tibia and tarsi largely smoky; in some specimens the mid- and hind femora show a brownish spot apically; fore tibia about one and one half times as long as the femur and about the same length as the whole tarsus (femur, 30, tibia, 45, tarsi, 2, 15, 11, 7, 4); hind tibia about equal in length to femur and twice the length of tarsus. Wings and veins hyaline, cross-veins faint except at apex of primaries where they are strongly anastomosed. Length of body 6 mm.; of forewing 6 mm.

Female. Rather ruddier brown than in the male; head lighter brown, shaded slightly with black in central area; behind the ocelli on each side of the median line is a small tubercle and another similar pair, wider apart, on the posterior margin; the subanal plate is very long and narrowed apically, the truncate apical margin showing at times a slight excavation.

Holotype—♂, Ottawa Golf Club (near Hull), Que., July 30, (J. McDunnough); No. 1277 in the Canadian National Collection, Ottawa.

Allotype—♀, same locality, June 31, (G. S. Walley).

Paratypes—9 ♂, 16 ♀, taken at same locality on various dates between July 21 and Aug. 19 by J. McDunnough, G. S. Walley and F. Ide.

The species is readily recognized in the male sex by the long third joint of the forceps (about one half the length of the second) and the comparatively short fore tarsus. The subimago has unicolorous deep blackish wings.

***Ephemerella sordida* n. sp.**

Male. Eyes (dried) deep black-brown; head and thorax black-brown, the pleura shaded with lighter brown and the lateral extensions of the mesosternum between first and second pairs of legs shaded with paler color; abdomen dorsally dull blackish, shading into brown on the three posterior segments, ventrally paler, smoky, the last segments opaque, pale gray; forceps, penes and setae whitish, the latter without dark rings. Legs pale yellowish, forelegs more or less tinged with smoky, two hind pairs of femora with traces of brown apical spots; fore tibia twice the length of femur and slightly longer than entire tarsus (femur, 25, tibia, 50, tarsi, 2, 15, 15, 10, 5); hind tibia equal in length to femur and about one and one half times as long as tarsus. Wings hyaline with pale venation, the crossveins, as usual, only well defined in apical area of primaries, where they are strongly anastomosed. Length of body 5 mm., of forewing 6 mm.

Holotype—♂, Lachine, Que., Aug. 6, (G. S. Walley); No. 1280 in the Canadian National Collection, Ottawa.

Paratypes—1 ♂, same data; 3 ♂, Ottawa Golf Club, Que., Aug. 13, 14 (F. Ide).

The species is apparently allied to *serrata* Morg. but is much darker in coloration; the lateral margins of the penes near the apices are prolonged into two short teeth, projecting dorsally and best seen when viewed from the side. The plain white setae are also quite characteristic.

***Ephemerella atrescens* n. sp.**

Subimago with deep blackish wings.

Male. (living) Eyes brown, blackish at base. Head and thorax entirely deep blackish, laterally the sutures of thorax slightly tinged with brown. Abdomen dorsally deep black-brown with faint traces of two subdorsal paler streaks, ventrally paler, the eighth and ninth segments being largely suffused with dirty whitish; forceps whitish, penes black; setae white, very faintly and narrowly ringed with brown. Legs pale whitish yellow, the fore tibiae and tarsi tinged with smoky, the two hind pairs of legs with prominent brown spot at apex of femora; fore tibia twice the length of femur and slightly longer than tarsus; relative lengths—femur, 25, tibia, 50, tarsi, 2, 17, 15, 9, 4. Wings hyaline with brown tinge at base, veins colorless, costal crossveins only present at apex of wing.

Female. Very similar to male, head between eyes shaded with pale-brown; abdomen ventrally with anterior segments edged posteriorly with whitish.

Holotype—♂, Ottawa (Rideau River) Ont., June 16, 1924, (J. McDunnough); No. 1272 in the Canadian National Collection, Ottawa.

Allotype—♀, same date.

Paratypes—Numerous ♂ and ♀ from same locality and from Ottawa Golf Club (Ottawa River) Que., collected at various times in June and August in 1922-24 by J. McDunnough, R. Ozburn, F. P. Ide and G. S. Walley.

The species resembles in size and color *Choroterpes basalis*; I had at first identified it as *deficiens* Morgan but it lacks the broad yellow band on the sternum mentioned in the original description; the male penes (dried) are two simple prongs with an apical U-shaped excavation between, extending about one third of the distance to the base. There seem to be two generations in the year.

**THE IDENTITY OF *PLATYCAMPUS VICTORIA* MACGILLIVRAY
(TENTHREDINIDAE, HYMENOPTERA).***

BY H. L. VIERECK,

Ottawa, Ont.

Believing that *Platycampus victoria* MacGillivray¹, reared from larvae on *Populus italicica* (Lombardy poplar), might prove to be the same as some European Nematine feeding on poplars, a ♀ paratype of *Platycampus victoria* was sent to Rev. F. D. Morice for his opinion.

Rev. Morice writes—"I feel no doubt whatever that it is a female of *Trichiocampus viminalis* Fall." It is quite likely that this species was introduced directly from Europe into British Columbia for there seems to be no record of its occurrence elsewhere in North America excepting Ontario, New York and Connecticut, where it is said to have been reared from indigenous poplars.²

*—Contribution from the Division of Systematic Entomology, Entomological Branch, Dept. of Agriculture, Ottawa.

1. Can. Ent., LII (61) 1920.

2. Rohwer, Proc. U. S. N. M., LX (8) 1922.

NEW SPECIES OF XYLOTA (SYRPHIDAE, DIPT.).*

BY C. H. CURRAN,

Ottawa, Ont.

Xylota lovetti new name

This name is proposed for *X. bivittata* Lovett, (Proc. Calif. Ac. Sci., X, 52), nec Bigot, Ann. Soc. Ent. Fr., 1884, 547.

Xylota oregonia new species

Belongs to the *metallica* group. Abdomen with two pairs of transverse, rectangular, yellowish spots, situated on the second and third segments.

Length, 10 mm. *Female*. Face dirty yellowish, the upper, lateral and lower portions at the sides more brownish, the whole moderately grey pollinose. Front black; the lower fifth brown, with greyish pollen laterally; sides gently divergent from vertex to lower fifth; pile sparse, short yellow, black on upper sixth. Beard white. Antennae luteous; third oint oval; arista brown.

Thorax blackish, with brassy reflections, clothed above with short, yellow, appressed pile; pleura, notopleura and humeri greyish pollinose and white pilose; pleura bare in front and behind.

Femora black, the immediate apices pale; tibiae pale yellow, the front ones with obscure, broad postmedian brownish band, the posterior pair black on apical two thirds. Tarsi pale yellow, the two apical joints brown. Wings cinereous hyaline. Squamae white, with white fringe. Halteres pale yellow.

Abdomen shining greenish black, the posterior margins of the second and third segments and the rather narrow median vitta opaque or subopaque black. Pile short, sparse, whitish on the first segment and anterior angles of the second; yellowish on basal half of the second and third and the large triangles on the sides of the fourth segment, elsewhere black. The yellow spots on the second segment occupy three fourths the length of the segment; on the third they are two-thirds the length of the segment and are narrowly separated from the lateral margins, except in front, by an obscure, slender brownish triangle.

Holotype—♀, Corvallis, Ore., March 15, (A. L. Lovett); No. 1337 in the Canadian National Collection, Ottawa.

Paratype—♀, same locality, but bearing only the rearing number, No. 1947.

This is the species recorded from Oregon by Lovett as *X. subfasciata* Lw.

Xylota subtropicus new species

Allied to *X. metallica* Wied. Front four legs entirely reddish yellow; posterior femora pale on basal third.

Length, 8 mm. *Male*. Face and front black; except the supra-antennal area, greyish pollinose. Vertical triangle greenish black, with long, sparse golden pile; frontal triangle and lower occiput white haired; occiput above with golden yellow hairs and cilia. Antennae yellowish brown, the oval third joint yellow on lower half; arista reddish with brownish apex.

Thorax greenish black, a little bronzed, the pile pale brassy yellow or cinereous according to view, the pleura with paler pile.

*—Contribution from the Division of Systematic Entomology, Entomological Branch, Dept. of Agric., Ottawa.

Legs reddish yellow; apical two thirds of posterior femora and apical three-fourths of their tibiae black; apical two tarsal joints brownish, anterior four tibiae and tarsi very pale yellow; pile of legs pale. Hind trochanters angulated but without spur. Wings cinereous hyaline. Squamae white with yellow border and fringe, halteres reddish.

Abdomen metallic blackish green; second segment reddish yellow, with slender median vitta and the apical fourth (narrowed laterally) opaque brown and clothed with black hairs, the pale spots longer than wide; third segment with the basal two-thirds yellow with metallic reflection, with median vitta and apex opaque black and black haired; abdomen elsewhere with yellow pile, including the entire lateral margins.

Holotype—♂, Memphis, Tenn., June 17, 1922, No. 1338 in the Canadian National Collection, Ottawa.

Paratype—♂, same data.

This species is smaller and much more slender than *metallica* and has the oral margin decidedly less produced.

Xylota plesia new species.

Allied to *curvipes* Loew and *vecors* O. S. It is distinguished from *curvipes* as follows: the posterior coxae are usually at least obscurely reddish subbasally on the outer side, the posterior tibiae lack the dense, short, erect black pile on the ventral surface and the "arms" of the genital claspers lack the large tubercular projection before their base on the inner side. In *vecors* the posterior coxae are wholly reddish and the dense short pile is wanting on the posterior tibiae. *X. plesia* may be distinguished from *vecors*, in addition to the color of the coxae, by the shape of the genital claspers: in *plesia* there is a long arm which is somewhat narrowed basally, while in *vecors* the "arm" is gradually widened and joins the basal portion in a gradual curve and there is no strong emargination at the base of the "arm" as in *plesia*.

Holotype—♂, Bathurst, N. B., June 15, (J. N. Knull); No. 1339 in the Canadian National Collection, Ottawa.

Allotype—♀, same data.

Paratypes—♂, ♀, Megantic, Quebec, June 21, 20, 1923, (Curran); ♂, Co. Hastings, Ont., June 4, 1903 (Evans); ♀, Norway Point, Lake of Bays, Ont., July 20, 1919, (J. McDunnough).

The three closely related species mentioned above may be distinguished as follows:

1. Posterior tibiae with rather short, dense, erect pile on ventral surface; arms or genital claspers with large, tubercular swelling before the basal emargination *curvipes* Loew.
Posterior tibiae without dense, erect pile; arms of genital claspers without large sub-basal swelling 2.
2. Posterior coxae chiefly black; arms of genital claspers slightly narrowed to the base where there is a strong emargination *plesia* Curran
Posterior coxae wholly reddish; arms of genital claspers gradually increasing in width and merging into the large basal section, without strong emargination *vecors* O. S.

OBSERVATIONS ON THE CHERMIDAE (HEMIPTERA; HOMOPTERA).¹
PART II.

BY G. F. FERRIS,

Stanford University, California.

In continuation of this series of papers I am presenting figures and descriptions of the nymphs of two species which are the types of their respective genera and of a third which may or may not be the type of its genus, depending upon the view which one takes of a nomenclatorial difficulty.

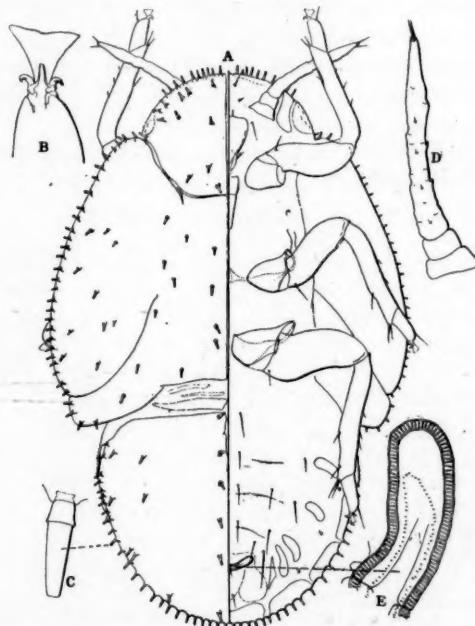


Fig. 1. *Trioza urticae* (Lin.). A.—Fifth stage of nymph; B.—apex of tarsus; C.—sectaseta; D.—antenna; E.—anal area.

The absence of detailed comparative studies of the nymphs of this family is responsible for the fact that no adequate terminology exists for some of the structures found. Consequently I have in another paper introduced the term *sectaseta* for the curiously modified setae which occur characteristically in the *Triozinae*. These structures are apparently modified setae and are associated with, if not responsible for, the formation of the slender waxen threads that are characteristic of the nymphs of many of this subfamily.

The nymphs of this family, as far as may be judged from the material now available to me, may be regarded as divisible into two more or less distinct types, on the basis of form. In the one group the wing pads are produced cephalad at the humeral angle and otherwise so arranged that their margin is more or less continuous with the margins of head and abdomen. As the most perfect example of this type there may be taken the nymph of *Ceropsylla sideroxyli*.

1.—Continued from Canadian Entomologist 55 : 256. (1923).

which is described in the first paper of this series. As this type appears to be most strikingly developed in the Triozinae it may be spoken of as the triozine form. In the second type the wings are not produced cephalad at the humeral angle and they project prominently from the contour of the body. Although this form occurs in other groups than the Psylliinae it is characteristic of this subfamily and may be spoken of as the psylliine type. By the use of these terms much circumlocution may be avoided.

***Trioza urticae* (Linnaeus).**

Fig. 1.

MATERIAL EXAMINED. Adults and nymphs from nettle, England. These were received through the kindness of Mr. F. Laing of the British Museum.

NYMPHAL STAGES. My material contains nymphs of the final stage only.

Fifth stage (Fig. 1 A). Length 2 mm. Of triozine form, rather narrowly oval, the humeral angle of the wing pads produced forward to the posterior margin of the rather small eyes and broadly rounded. Dorsum strongly chitinized throughout except for a small area at the base of the abdomen, the derm presenting a slightly vermiculate appearance, but entirely devoid of chitinous points. Margin of the body with a continuous series of rather stout setasetae (Fig. 1 C) which are quite widely spaced; these occur also very sparingly over the dorsum in a rather definite arrangement as indicated in the figure.

Antennae (Fig. 1 D) quite short, apparently consisting of but three segments, the third relatively very long and bearing three or four small sensoria. This third segment bears constrictions which give it a segmented appearance, but careful examination of very favorable specimens reveals no actual jointing. Legs relatively small, the femora not or scarcely attaining the margin of the body; without trochanter; with the tibio-tarsal articulation well defined; claws present, the pulvillus (Fig. 1 B) triangular, slightly petiolate.

Ventral side with the derm membranous except for faint areas about the anal area, the marginal zone and small areas near the spiracles, these beset with minute, chitinous points. Anal opening set well away from the apex of the abdomen; external circum-anal pore ring consisting of a single row of slit-like pores, the internal ring of a single row of faint, minute, circular pores (Fig. 1 E).

Note: This species is the type of its genus.

***Paratrioza cockerelli* (Sule).**

Fig. 2.

MATERIAL EXAMINED. Adults and nymphs from tobacco, on the campus at the University of California, Berkeley, California. These were received through the kindness of Professor E. O. Essig and are labeled as having been identified by Crawford.

NYMPHAL STAGES. My material contains nymphs of the final stage only.

Fifth stage (Fig. 2 A). Length 1.8 mm. Of triozine form, somewhat broadly and irregularly oval, the humeral angle of the wing pads produced forward almost to the anterior margin of the eyes and bluntly rounded. Dorsum strongly chitinized throughout except for a small area at the base of the abdomen, the derm presenting a slightly vermiculate appearance but entirely de-

void of chitinous points. Margin of the body with a continuous series of quite short and stout setasetae (Fig. 2 C); these are entirely lacking on the dorsum.

Antennae (Fig. 2 D) as in *Trioza urticae*, the third segment very long, with faint constrictions but with no actual jointing. Legs quite short, the femora far from attaining the margin of the body; without trochanter; claws present, the pulvillus broadly triangular, sessile.

Ventral side with the derm apparently membranous throughout. It is possible that faint areas of chitinization are obscured by the heavy chitinization of the dorsum however. Anal area and marginal zone with faint areas beset with minute chitinous points. Anal opening set well away from the apex of the abdomen; outer circum-anal pore ring consisting of a single row of slit-like pores, the inner ring with small, more or less circular pores.

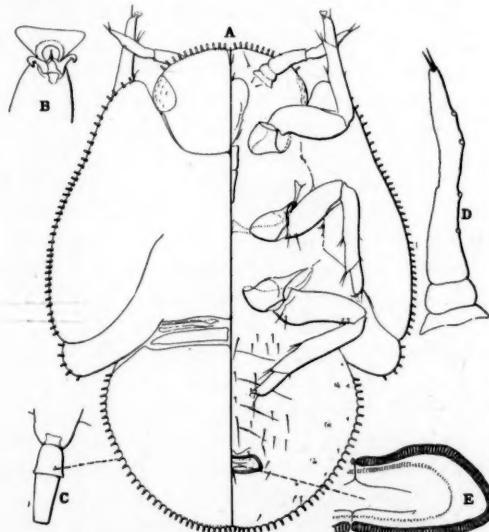


Fig. 2. *Paratriozia cockerelli* (Sulc). A.—Fifth stage of nymph; B.—apex of tarsus; C.—setaseta; D.—antenna; E.—anal area.

Note: This species is the type of its genus. It is not my purpose to discuss until later any of the questions as to generic relationships that may arise but I may note here that the nymph of this species much more closely resembles that of *Trioza urticae* than do those of some of the other species that are still retained in *Trioza*.

Psyllia alni (Linnaeus).

Fig. 3.

MATERIAL EXAMINED. Nymphs and adults from alder, England. These were received through the kindness of Mr. F. Laing of the British Museum.

NYMPHAL STAGES. My material contains nymphs of the final stage only.

Fifth stage (Fig. 3 A). Length 2.6 mm. Of the characteristic psylline form. Dorsum with the derm largely membranous, but with the wingpads, a pair of large areas which occupy most of the head and nearly the posterior half of the abdomen heavily chitinized. In addition to these areas there are smaller

areas of chitinization, distributed as indicated in the figure. The derm is beset with numerous small, slender setae, these becoming longer on the margins of the wingpads. Margins of the abdominal chitinized area with five quite stout setae. The derm of these areas is entirely smooth.

Antennae (Fig. 3 C) very slender, nearly as long as the body, eight-segmented, the last four segments faintly imbricate. The third segment in some specimens shows faint traces of segmentation at about its middle, but in others there is no evidence of this. Legs relatively very large, the femora much exceeding the margin of the body; without trochanter; claws present, the pulvilli (Fig. 3 B) large, triangular and quite markedly petiolate.

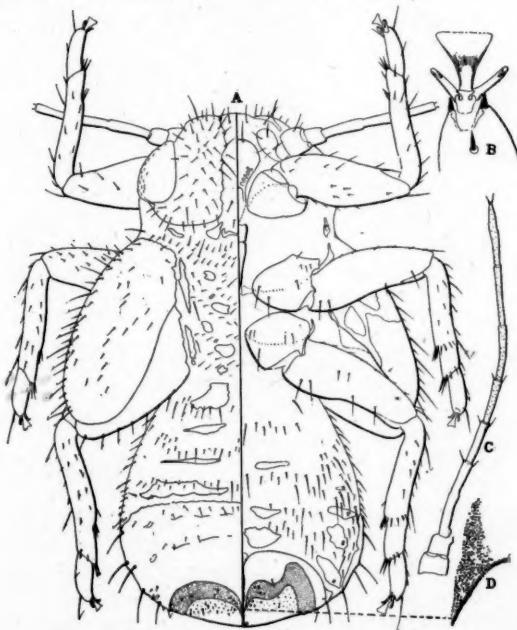


Fig. 3. *Psyllia alni* (L.). A.—Fifth stage of nymph, terminal segments of antennae not shown; B.—apex of tarsus; C.—antenna; D.—portion of circumanal pore ring.

Ventral side membranous except for about the apical fourth, a small area about each of the last three spiracles and three pairs of small submedian areas. The anal opening is at the tip of the abdomen and the circum-anal pore ring is greatly modified. It occupies the same position morphologically as in the species where the anus is remote from the apex of the abdomen but the shifting of the anus to the apex of the body brings the pore ring to lie partly on the dorsal and partly on the ventral side. In addition to this the pore ring has become greatly enlarged and consists of myriads of minute circular pores, with a single row of slit-like pores along its inner margin (Fig. 3 D). Enclosed within this ring is a secondary ring composed of much more minute and much less conspicuous pores.

Note: Crawford considered this species to be the type of the genus

Psylla but according to Van Duzee the type of this genus—or *Psyllia* as it is now called—is *pyri* (L.). If the latter be the case the situation is rather unfortunate for very little seems to be known about this species. The matter is of some importance for there are two very distinct types of nymphs represented among the species now referred to this genus.

A NOTE ON TWO GENERA OF SPIDERS, MYSMENA AND MICRODIPHOENA.

BY C. R. CROSBY,

Ithaca, N. Y.

In 1919 W. M. Barrows (Ohio Journ. Sci. 19 : 210-212) gave an interesting account of the taxonomic position and habits of *Glenognatha bulbifera* Banks, placed by the author in the genus *Mysmena* (1896). I wish to add that this species was well figured and named *Theridium foxi* by McCook (American Spiders and their Spinning Work, 3, plate XXIX, fig. 1, 1893). There was no verbal description but as the figure is clearly recognizable the species should be known as *Glenognatha foxi* McCook.

I found this spider common on the sidewalks at Columbia, Mo., in 1905. I also collected a male on a walk in Ithaca, N. Y., July 30, 1916.

I recently examined the type of *Mysmena quadrimaculata* Banks in the Museum of Comparative Zoology. It is a female and is not closely related to *foxi*. In the time at my disposal I was not able to place it generically, but it is not a true *Mysmena*.

This removes from *Mysmena* all the American species placed there by Banks. But on examining some specimens of *Microdipoena guttata* Banks I was surprised to find that they are very closely related to *Mysmena leucoplagiata* E. Simon of Europe, the type of the genus. In fact the two species are not easily separated. *Microdipoena*, therefore, becomes a synonym of *Mysmena*.

NOTES ON SOME SPECIES OF THE GENUS ERISTALIS
(SYRPHIDAE, DIPTERA.)*

BY C. HOWARD CURRAN,

Ottawa, Ont.

Superficially *Eristalis compactus* Walk and *E. cryptarum* Fabr., are very similar but there are apparently quite constant differences.

E. compactus Walker. Scutellum, black pilose on the disk, rarely with only a few black hairs; usually all, but sometimes only the anterior tibiae largely black pilose; arista quite bare; front with a wide band of black pile across the ocelli. Occurs in North America.

E. cryptarum Fab. Scutellum wholly tawny pilose; all the tibiae reddish pilose; arista very short plumose; black pilose band on front narrower. Occurs in Europe.

Eristalis broussii Williston. This name must be used for the North American species which has gone under the name *E. meigenii* Wd. for years. While the North American specimens agree fairly well with Wiedemann's description of *meigenii* the insects are quite different. *Meigenii* has more extensively dark legs and more extensively opaque markings on the thorax.

*—Contribution from the Division of Systematic Entomology, Entomological Branch, Dept. of Agric., Ottawa.

A NEW SPECIES OF POLYGRAPHUS (COLEOPTERA)*

BY J. M. SWAINE,

Ottawa, Ont.

Polygraphus hoppingi n. sp.

This entirely distinct species was taken by Mr. Ralph Hopping from *Picea engelmanni* in the San Francisco Mts. of northern Arizona.

It is distinguished from *rufipennis* Ky. by the very strongly acuminate apex of the antennal club and by the broad impression and the long vestiture on the front of the female. It is, moreover, evidently a larger species and of a more elongate form.

Length, 3.5 m. Relative measurements; length of pronotum, 5; width of pronotum, 6.5, length of elytra, 11.5; width of elytra, 6.8; black, with the pronotum and elytra partly reddish.

The head of the female has the front very broadly but distinctly concave, very densely punctured and clothed with long yellow hairs which become much longer and closer about the sides, thus appearing from above much more densely hairy than does the female of *rufipennis*; the antennal club closely hairy with the apex sharply acuminate, extended into an elongate spine-like process; the eyes divided with the parts of each very narrowly separated, usually with only one ommatidium intervening between the adjacent horns of the halves of the ommateum.

The pronotum has the sides parallel on the caudal half, strongly constricted in front and broadly rounded on the cephalic margin; the punctures of the disc very small, deep, rather close, feebly granulate; the pubescence very short; the median line smooth, very narrow and feebly carinate.

The elytra are more elongate than in *rufipennis*, but otherwise closely similar, with the strial punctures indistinct, the whole surface very densely, finely granulate-punctate, the larger of the granules sparsely, somewhat uniserially arranged on the disc but becoming very much larger and very numerous near the basal margin; the sutural striae alone distinctly impressed on the disc, but on the declivity the striae distinctly impressed and the rows of interstrial granules larger and more regular; the pubescence of very minute scales, not covering the surface, with the rows of longer interstrial scales barely evident.

The male has the front of the head convex, the punctuation small and only moderately close, with a transverse elevation between the eyes surmounted by a geminate tubercle on the median line, with a strong transverse impression between the elevation and the epistoma; the interstrial rows of larger scales are somewhat more distinct than in the two females.

Holotype—♀, San Francisco Peak, Arizona, June 20, 1918, *Picea engelmanni*, (R. Hopping,) No. 1329 in the Canadian National Collection, Ottawa.

Allotype—♂, same data.

Paratype—1 ♀, same data, in the collection of Mr. Hopping.

BOOK REVIEW

North American Cerambycid Larvae;—F. C. Craighead, Dominion of Canada Department of Agriculture, Bull. No. 27, New Series, (Technical) 150

*—Contribution from Division of Forest Insects, Entomological Branch, Dept. of Agriculture, Ottawa.

pages, 44 plates, 8 text figures, Ottawa, 1923. (Sold by the King's Printer, Ottawa, Canada, Price \$1.00).

For some years students of North American Cerambycidae have looked forward to the publication of Doctor Craighead's studies on the larvae of this family. The present bulletin is an exceedingly valuable contribution. It is based on a careful and scientific study of a large proportion of the North American cerambycid larvae, and presents in a concise and well arranged form the information that has been so greatly needed. Not only will the keys and descriptions make accessible to us a field that has been almost wholly neglected hitherto; but this exposition of the larval characters should stimulate further study of the adults and assist in improving the classification of the Family.

The first twenty-five pages of the bulletin are devoted to a discussion of the classification of the larvae as correlated with that of the adults, biological characteristics correlated with anatomical structures, a summary of habits, and an account of the larval structures.

Very interesting and suggestive correlations between the larval and adult classifications are discussed in the first chapter and are referred to repeatedly throughout the text—"Again and again in rearing unidentified larvae it has been possible, from a knowledge of their structures and habits, to predict very accurately the systematic position of the adults which would be reared therefrom."

A striking parallel modification of certain morphological features was found to exist in widely separated species and genera living under the same environment or having similar habits; and, conversely, closely related larvae living under different conditions often exhibited marked divergences in certain characters.

The discussion of the anatomy includes twelve pages, with seventeen text figures. The presentation is clear and concise and is sufficiently detailed to give a proper understanding of the descriptions given in the text.

In the classification of the larvae the following subfamilies are recognized: *Prioninae*, *Aseminae*, *Lepturinae*, *Disteniinae*, *Cerambycinae* and *Lamiinae*.

The students of the classification of the adult Cerambycids will find many points of striking interest. The *Aseminae* and *Lepturinae* are treated as of subfamily rank.

Asemum, *Criocephalus* and *Nothorhina* cannot be separated generally as larvae, *Hylotrupes bajulus* seems a distinct group in the *Callidini*. *Plagionotus*, *Arhopalus*, *Calloides* and *Cyllene* cannot be recognized in the larval stage and are considered as a natural genus. The larvae of *Cyllene pictus* and *C. robiniae* are abundantly distinct. Several species of *Elaphidion* separate as larvae into a distinct genus. The genera *Bellamira*, *Typocerus*, *Strangalia* and *Leptura*, as grouped by American writers, cannot be recognized as larvae. The larvae of the *Lamiinae* are sharply contrasted from all other Cerambycids and show a greater diversity of form and habit than any other subfamily. Although the larvae of only a small percentage of the species of the group have been included in the key many very interesting relationships are apparent.

It is unfortunate that, owing to the absence on field work of those responsible for editing this bulletin, a number of errors in the spelling of technical names were overlooked in the proof. There are forty-four excellent full page plates, twelve of which are in heliotype.

J. M. SWAINE.

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